Agilent Cary 60 UV-Vis

Efficient. Accurate. Flexible.

Guaranteed specifications

Introduction

The Agilent Cary 60 UV-Vis spectrophotometer is efficient, accurate and flexible, and is designed to meet both current and future measurement needs. The proven, robust design of the Cary 60 comprises a double beam, Czerny-Turner monochromator, 190–1100 nm wavelength range, 1.5 nm fixed spectral bandwidth, full spectrum Xenon pulse lamp single source with exceptionally long life, dual silicon diode detectors, quartz overcoated optics, scan rates up to 24,000 nm/min, 80 data points/sec maximum measurement rate, non-measurement phase stepping wavelength drive, room light immunity, central control by PC with Microsoft® Windows® operating system. Supported by GLP software, optional 21 CFR Part 11 capable software, and dedicated instrument validation software which includes pharmacopeia test suites.

Agilent Cary 60 UV-Vis spectrophotometers are manufactured according to a quality management system certified to ISO 9001. The guaranteed specifications are listed in this document and are based on the 4 sigma statistical confidence level of the final acceptance tests performed at the factory.

Features, advantages and benefits

Feature	Advantage/Benefit
Xenon pulse lamp source	Eliminates photobleaching while allowing the highest quality data to be collected over the complete UV-Vis range — all at the lowest cost of ownership due to an exceptionally long lamp life.
Room light immunity	Unique optical design allows accurate sample measurement even with the sample lid open — especially useful for enzyme assays, fiber-optic based measurements or high throughput QA/QC labs.
1.5 nm fixed spectral bandwidth	Gives excellent spectral resolution for solids and liquids and meets international Pharmacopoiea compliance regulations.
190–1100 nm wavelength range	Complete coverage of UV-Vis range and extending up into the NIR.
24,000 nm/min maximum scan rate	Allows complete spectral range scanning in under 3 seconds, ideal for fast kinetics or high sample throughput.
80 data points/second maximum measurement rate	Allows accurate measurement of sub-second kinetic reactions with excellent data fitting.
Photometric range up to 4 Abs	Permits the analysis of highly turbid solutions and a wide range of sample concentrations (optical densities), as well as reducing sample preparation (dilution) requirements.
Non-measurement phase stepping wavelength drive	Means that sample and reference measurements are made at the same wavelength ensuring that no peak shifts are observed — even when measuring at the fastest scan speeds.
Focused beam measuring 1.5 x 1.0 mm	Ensures efficient energy coupling to accessories including fiber optic probes and ultra-microvolume cuvettes for measurement of low volume samples.

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Instrument hardware

Source	
	Unique full-spectrum Xenon flash lamp (80 Hz) with typical lifetime of 10 years (guaranteed 3 years)
Monochromator	
	Czerny-Turner
Grating	
	Holographic, 27.5 x 35 mm, 1200 lines/mm, blaze angle 8.6° at 240 nm
Beam splitting system	
	Beam splitter
Detectors	
	2 silicon diode detectors for simultaneous sample beam and reference beam measurements
Optical design	
	Double beam Czerny-Turner monochromator
UV-Vis limiting resolution (nm)	
	≤ 1.5 nm
Toluene/hexane limiting resolution (EP/BP and TGA test)	
	≥ 1.5

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Agilent Cary 60 UV-Vis guaranteed specifications

Instrument hardware

Stray light (%T)		
	At 198 nm (12 g/L KCl, TGA & BP/EP method)	≤ 1%
	At 220 nm (10 g/L NaI ASTM method)	≤ 0.05%
	At 370 nm (50 mg/L $NaNO_2$)	≤ 0.05%
Wavelength range (nm)		
	190–1100 nm	
Wavelength accuracy (nm)		
	± 0.5 at 541.94 nm	
Wavelength reproducibility (nm)		
	± 0.1 nm	
Photometric accuracy (Abs)		
	Using NIST 930E filters at 1 Abs	± 0.005 Abs
	At 0.2, 0.5 & 0.75 Abs (14.2% w/v KNO_3, TGA method)	± 0.01 Abs
	0.292 to 0.865 Abs (60.06 mg/L $K_2Cr_2O_7$, BP method)	± 0.01 Abs
Photometric range (Abs)		
	± 4.0 Abs	
Photometric display		
	± 9.9999 Abs, ± 200.00 %T	
Photometric reproducibility (Abs)		
	Using NIST 930E filters, at 465 nm, 2 s SAT	
	Maximum deviation at 1 Abs	< 0.004 Abs
	Standard deviation for 10 measurements	< 0.00050 Abs
	Using NIST 930E filters, at 546.1 nm, 2 s SAT	
	Maximum deviation at 0.5 Abs	< 0.003 Abs
	Standard deviation for 10 measurements	< 0.0030 Abs
Photometric stability (Abs/hour)		
	500 nm, 10 s SAT	< 0.0004 Abs
Photometric noise (Abs, RMS)		
	500 nm, 1 s SAT	At 0 Abs < 0.0001 Abs
		At 1 Abs < 0.0005 Abs
		At 2 Abs < 0.005 Abs
	260 nm, 1 s SAT	At 0 Abs < 0.00015 Abs
Baseline flatness (Abs)		
	200 to 850 nm, smooth 21 filter applied, baseline corrected	± 0.001 Abs
Compartment size (width x depth x height)		
	130 mm x 523 mm x 123 mm Note that sample compartment can be left open during measurement due to room light immunity of Cary 60	
Sample compartment access		
	Top and front	

Recommended environmental conditions

Instrument dimensions (width x depth x height)

Packed 595 x 710 x 350 mm (24 x 28 x 14 in)
Unpacked 477 x 567 x 196 mm (19 x 23 x 8 in)
The Cary 60 has been designed to withstand the weight of a PC monitor up to 10 kg (33 lb)

Instrument weight

Packed 23 kg (51 lb), Unpacked 18 kg (40 lb)

Instrument conditions

Condition	Altitude (m, ft)	Temp. (°C, °F)	Humidity (%RH) non-condensing
Non-operating (transport)	0–4600, 0–15000	-40–75 °C, -40–167 °F	15–90%
Operating within performance specifications	0–3100, 0–10000	5–40 °C, 41–104 °F	50–80%

For optimum analytical performance, it is recommended that the ambient temperature of the laboratory be between 20–25 °C and be held constant to within ±2 °C throughout the entire working day

Instrument electrical requirements

A standard 3.2 A/12 V plug pack is provided. Power cords are provided based on the user's country requirements. Only the supplied power supply is to be used with this equipment.

Required supply voltage	100–240 V AC, Frequency 47-63 Hz
Nominal rating	Scanning: 18 W, Idle: 9 W

Operational

Spectral bandwidth (nm)

Fixed at 1.5 nm (approximately)

Signal averaging (seconds)

0.0125–999 s

Maximum scan rate (nm/min)

24,000 nm/min

Slew rate (nm/min)

24,000 nm/min

Data interval (nm)

0.15–5.0 nm

Repetitive scanning

4800 data points per minute, maximum number of cycles: 999, maximum cycle time (min): 9999

Agilent Cary 60 UV-Vis guaranteed specifications

Operational

Data collection rate	
	80 data points/second
Temperature monitor	
	Temperature probe inside cuvette (using the Temperature Probe Accessory)
Minimum sample volume	
	0.5 µL

Customer support policies

Support and training	
	Agilent is renowned for providing expert applications and service support. Agilent has a global network of factory-trained specialists ready to provide support for hardware, software, or applications wherever you are located. Services include: • Full 12-month warranty support • Seven (7) year hardware support period from date of last unit manufacture. After this time, parts and supplies will be provided if available. • Preventive maintenance to deliver consistent operation and minimize downtime • Troubleshooting, maintenance and repair • Software support services • Compliance services including IQ and OQ of hardware and software • Comprehensive warranty extension and service contracts, including peripherals • Classroom training and onsite training delivered by experts

Further details

More information	
	For further information please consult your Agilent office or supplier, or our website at www.agilent.com

www.agilent.com/chem

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The Measure of Confidence

Agilent Technologies

Cell Holders and Bases

Description	Comments	Use With	Part No.
Standard cell holder, 10 mm, with Z-height adjustment from 0-20 mm, lifter, and ball bearing cuvette stabilizer	Supplied as standard with Cary 4000	All Cary except Cary 50/60	110721900
Test tube holder	Allows use of 16 mm od test tubes in the sample compartment instead of conventional cuvettes	Cary 50/60	7910033500
Long pathlength rectangular cell holder	Holds 20, 50, and 100 mm rectangular cells and rectangular flowcells	All Cary	110059900
Variable pathlength cell holder	For use with rectangular cells of 5, 10, 20, 30, 40, and 50 mm pathlength and a solid sample holder. Must be fitted in slide-mount solid sample holder kit in Cary 50/60 (p/n 10072300) or Cary 100/300 (p/n 10046500).	All Cary	210125300
Variable pathlength cell holder	For use with rectangular cells up to 100 mm pathlength and a solid sample holder. Must be fitted in slide-mount solid sample holder kit in Cary 50/60 (p/n 10072300) or Cary 100/300 (p/n 10046500).	All Cary	6610014000
Dual rectangular thermostattable cell holder	Allows thermostatting of standard 10 mm pathlength cuvettes with height 45 mm. Requires the extended sample compartment and an external water bath.	All Cary	10046800
Cylindrical single cell holder, ambient	Allows use of cylindrical cells with up to 100 mm pathlength	All Cary	110026900
Dual cylindrical thermostattable cell holder	Allows use of cylindrical cells with up to 100 mm pathlength. Requires extended sample compartment and an external water bath.	All Cary	10046700

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Standard cell holder, 110721900

Standard cell holder, 10 mm, 110260190

Variable pathlength cell holder, 210125300

Cylindrical single cell holder, ambient, 110026900

Agilent

Trusted Answers

Efficient. Accurate. Flexible.

Agilent Cary 60 UV-Vis Spectrophotometer

Agilent Cary 60 UV-Vis

Agilent is your premier resource and partner for molecular spectroscopy. The world-renowned Cary product line, comprises FTIR, UV-Vis-NIR, and fluorescence instruments and offers you a comprehensive range of molecular spectroscopy solutions.

Answers you can trust

The Agilent Cary 60 UV-Vis spectrophotometer is efficient, accurate, and flexible, and is designed to meet your immediate and future challenges. With remote sampling options, proven performance and low cost of ownership, you can be sure that the Agilent Cary 60 UV-Vis generates answers you can trust.

- Lowest cost of ownership—with an exceptionally long lifetime of 3 billion flashes, the lamp typically lasts 10 years, minimizing lamp replacement costs.
- No need for cuvettes—the optional fiber-optic probe delivers more accurate results in a fraction of the time, and with no cuvette or sipper, sample measurements are less prone to error.
- Measure precious samples with ease—the focused beam of the Cary 60 is perfect for measuring small volumes accurately and reproducibly. Preserve your samples by using less than 4 µL instead of mLs.
- Exceptionally fast data collection—with a scan rate of up to 24,000 nm/min, you can scan the entire wavelength range (190–1100 nm) in under 3 seconds.

For Your Application

Agilent is committed to providing solutions for your application. We have the technology, platforms, and expert guidance you need to be successful.

	Chemicals	Academic	Biotech & Pharma
Common applications for the Agilent Cary 60	Quality control of raw materials and finished goods Color measurements and color matching Analysis of nutrients in water, food, and agriculture Analysis of turbid solutions or relatively highly absorbing samples Analysis of bulk optics (e.g., sunglasses) Study of pigments in art conservation through reflectance measurements	Characterization of unknown or newly synthesized compounds Monitoring kinetics of chemical or biological reactions that occur at sub-second rate Measurement of films and optical components Analyzing photochemical reactions in-situ during sample irradiation	DNA and protein quantification Measuring cold biological samples (4 °C) immediately after removal from the refrigerator Preparation of fluorescent liquid samples before emission measurements Analyzing small amounts of precious sample (< 4 µL)
Common accessories for the Agilent Cary 60	Fiber optic transmission and reflectance probes and coupler Thermostatted single and multicell holders with temperature probes 18 position cell holder Rectangular, cylindrical, micro, and flow cells	Fiber optic transmission and reflectance probes and coupler Thermostatted single and multicell holders with temperature probes Solid sample holder Rectangular, cylindrical, micro, and flow cells	Fiber optic microprobe (liquids) Thermostatted single and multicell holders with temperature probes Microvolume cuvettes Rapid mix accessory

Molecular Spectroscopy Innovations

1947
First commercial recording UV-Vis, the Cary 11 UV-Vis

1954
Release of the Cary 14 UV-Vis-NIR

1969
First rapid-scanning Fourier transform infrared spectrometer, the FTS-14

1979
First use of a mercury cadmium telluride (MCT) detector in an FTIR

1982
First FTIR microscope, the UMA 100

1989
Release of the acclaimed Cary 1 and 3 UV-Vis

1999
First 256 x 256 MCT focal plane array for analytical spectroscopy

2000
First ATR chemical imaging system

2007
Smallest, most rugged commercially available interferometer introduced

2007
TumbIIR sample accessory introduced—a revolution in FTIR liquid sampling

2008 to 2011
Agilent offers handheld and out-of-lab FTIR solutions

2017
Acquisition of Cobalt Raman spectroscopy

2018
Cary 3500 UV-Vis and 8700 Laser Direct Infrared (LDIR) Chemical Imaging System launched

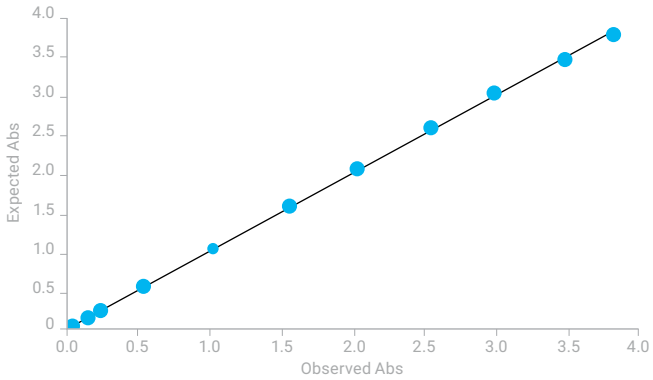
Quality and Performance by Design

Our proven record of optical design innovation ensures that you get the right answer every time.

The power of xenon

The Agilent Cary 60 uses the leadership and proven performance of its predecessor the Cary 50, the pioneer in UV-Vis xenon flash lamp technology. The Agilent Cary 60 is:

- Room-light immune—the unique optical design enables measurements to be made with the sample compartment open, allowing large or odd-shaped samples to be measured. The highly focused beam also provides superior coupling to fiber optics, making the Agilent Cary 60 the best choice for UV-Vis fiber optic measurements.
- Robust—the combination of the xenon lamp and superior mechanical design ensures the Agilent Cary 60 is inherently reliable. This reliability significantly reduces the cost of ownership. Many Cary 50 instruments purchased over a decade ago are still running with the same lamp today.
- Efficient—the lamp only flashes when a reading is taken, resulting in zero warmup time, and low electrical energy use and maintenance requirements. Photodegradation is also eliminated, as precious or light-sensitive samples are not excessively exposed to UV light or heat.
- Flexible—with a maximum power requirement of just 38 W, the Agilent Cary 60 can be run from a 12 V mains voltage inverter, making it suitable for mobile laboratories.



Superior accuracy and photometric linear range
The photometric range of the Cary 60 extends above 3.5 absorbance units. As shown above, a correlation coefficient of 0.999 was achieved when measuring certified standards (Starna, S/N 14727, set type RM-9ND). The absorbance was measured at 525 nm using a 1 second signal averaging time.

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Excellent noise performance

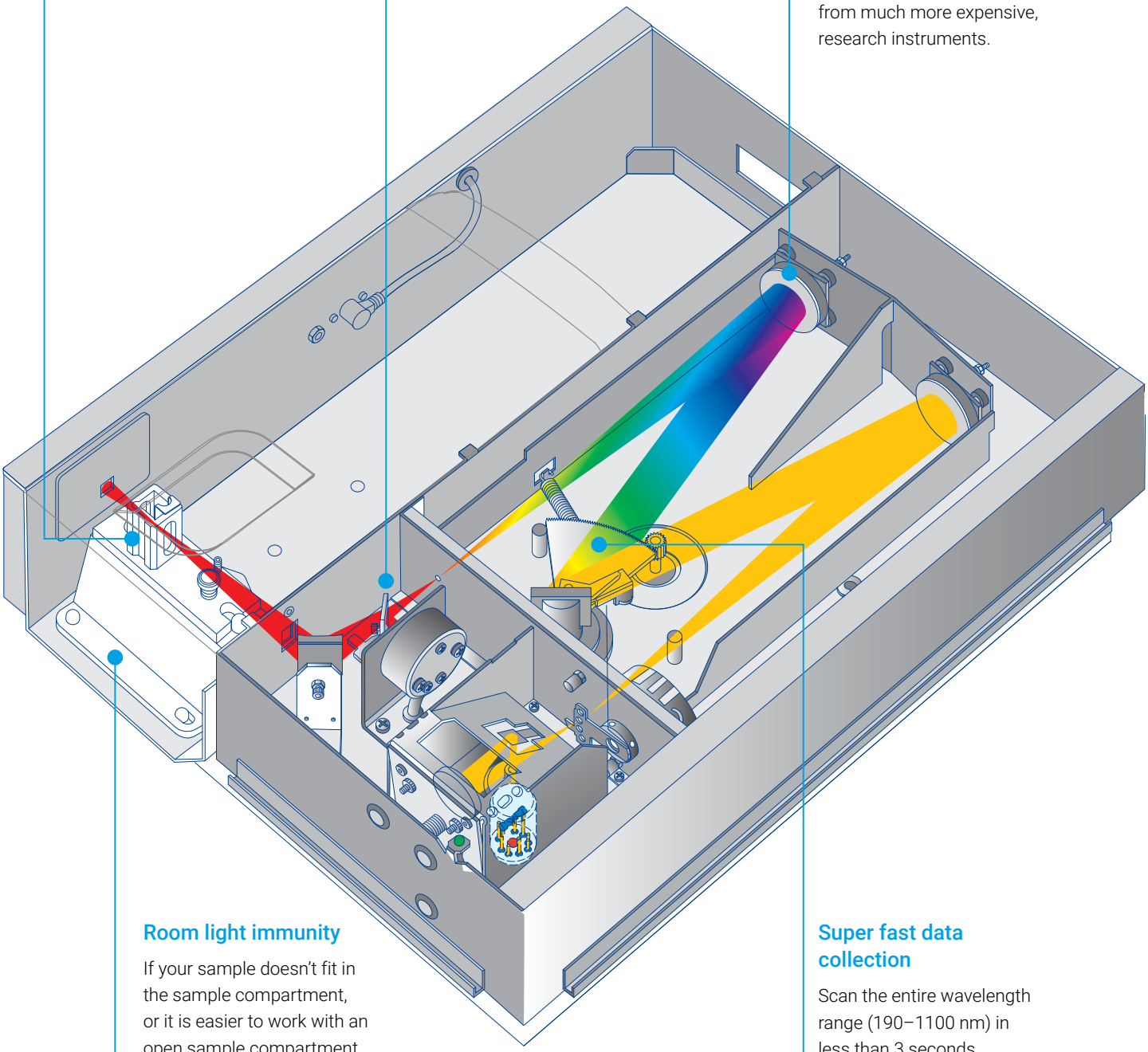
The light beam is very intense—less than 1.5 mm x 1.0 mm at its focus—ensuring excellent noise performance even when using small aperture microcells.

Simultaneous reference correction

Maintain peak integrity at every scan speed through simultaneous sample and reference beam measurements—equivalent to traditional double beam instruments.

Superior and proven optical design

Leveraging design capabilities from our research grade Cary spectrophotometers, the Cary 60 provides excellent optical performance. This performance includes photometric linearity and accuracy, typically expected from much more expensive, research instruments.



Room light immunity

If your sample doesn't fit in the sample compartment, or it is easier to work with an open sample compartment, then simply leave the lid off. The xenon flash lamp means the Cary 60 is not affected by room light.

Super fast data collection

Scan the entire wavelength range (190–1100 nm) in less than 3 seconds.

You can do it all with a Cary

The Cary 60 UV-Vis spectrophotometer is complemented by a range of accessories and software designed specifically for your application needs.

Performance enhancing accessories

The vast range of accessories for the Agilent Cary 60 UV-Vis ensures you can handle the widest variety of sample sizes and types[1].

Accessories for liquid samples include:

- Fiber-optic probes and couplers for fast accurate measurements without cuvettes.
- Peltier and water thermostatted single and multicell holders for precise temperature control.
- Temperature probes to measure the temperature inside the cuvette.
- Microvolume sampling cells to measure volumes <4 µL.
- Rapid mix accessory for stopped-flow kinetics measurements

Accessories for solids, powders, and pastes

- Solid sample holder to characterize a variety of sample types, including filters, powders, gels, optical components, and fabrics.
- Fiber optic reflectance probe and coupler.

Consumables for UV-Vis

- Agilent's range of UV-Vis consumables includes cuvettes, flow cells, and lamps.

1. Our list of accessories is ever growing. To find out about the latest available in your region, contact your local Agilent Representative or visit our website at www.agilent.com/chem/UV/

Distinctly Better Software

User friendly, application focused software provides complete instrument control.

Software designed for real samples

The modular design of the Cary WinUV software means that it can be tailored to suit your analytical requirements. Whether it's a QA/QC application requiring wavelength scanning, or life science applications that require advanced enzyme kinetics or thermal control, the software can accommodate your needs.

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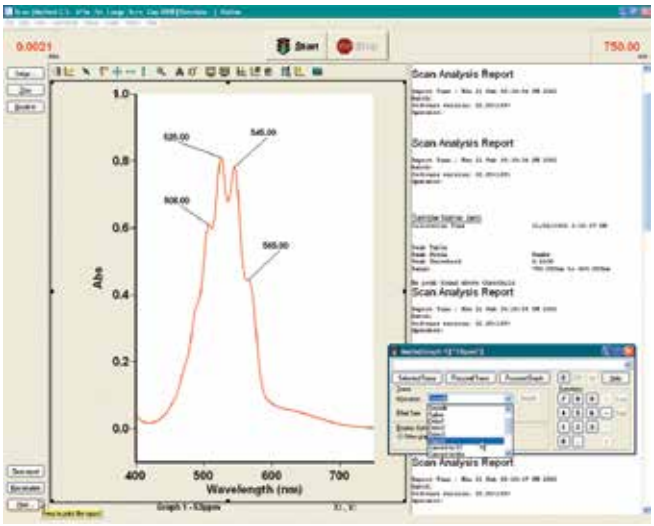
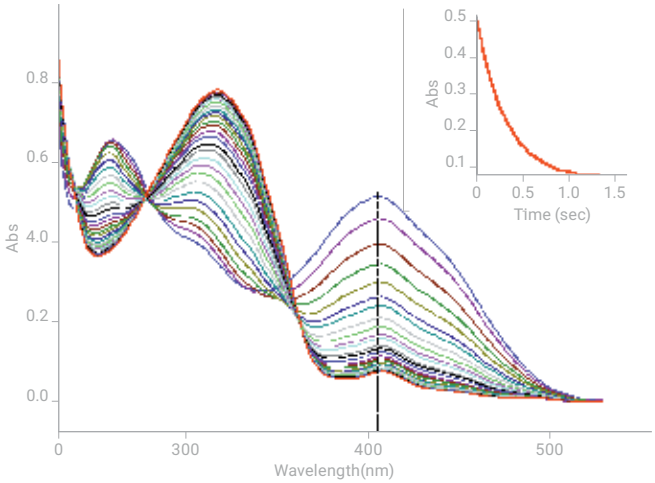


Dedicated software applications
Streamline your measurements and save time with the easy-to-use WinUV software. Calculate DNA purity or concentrations using the RNA/DNA module or study biological process with the enzyme kinetics module.

Enhanced graphics features
The graphics control module has automatic peak labeling, zoom, free and tracking cursor, multiple ordinate and abscissa formats. It also offers smart copy/paste and overlay modes, making spectral interpretation and presentation for publications a breeze.

Advanced data processing
Use the spectrum calculator to apply mathematical operations, including addition, subtraction, division, multiplication, log, and square root functions, to spectra. The calculator also features mean, normalization, smoothing, up to fourth order derivatives, integration, and the Kubelka-Munk correction algorithm.

Meet your application challenges
Use the powerful built-in Applications Development Language (ADL) to tailor the WinUV software to meet your most specific applications.



Obtain kinetics curves easily
With a mouse-click you can obtain a kinetics curve from a series of repetitive curves. The insert shows the kinetics curve at 410 nm.

Chemicals (QA/QC) Applications

When you need to consistently and cost-effectively deliver the highest quality finished products, innovative, reliable analytical solutions are essential to your success. The Agilent Cary 60 provides flexible sampling options and proven robustness, ensuring you can measure your samples with the highest accuracy.

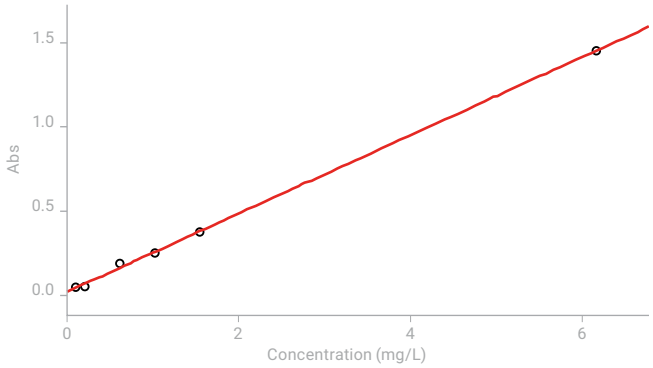
QA made easy

- WinUV software supports up to 30 standards and 5 replicates, to give you maximum flexibility to set precision levels.
- Flexibility to run basic methods and if needed advanced control, for method development.
- Preconfigured applications include single point reads, scanning, concentration, and kinetics measurements.

Flexible sampling

With a large sample compartment and room light immunity, the Agilent Cary 60 with fiber-optic probes is ideal for QC laboratories:

- Speed up production. Use fiber-optic probes to take measurements on the production line, rather than transfer liquid samples to cuvettes.
- Probes accommodate a wide range of sample volumes—from very large to microliter samples.
- Eliminates flow cell uptake times and system problems such as tubing leaks, degradation, and bubbles.



Nitrate analysis of water
The concentration of nitrates in wastewater was measured on the Agilent Cary 60 using the fiber optic dip probe. This technique reduced the time of analysis by over 50%, compared to traditional cuvette-based measurements. Data quality was not compromised, as shown by the excellent linearity of the calibration curve of Abs versus [NO^{3-}] mg/L. The fiber optic dip probe comes in a range of pathlengths (up to 40 mm) to cater for very low absorbing species.

Academic Applications

When you need to cater to many applications and user levels, flexibility and proven reliability are essential to your requirements. The Agilent Cary 60 provides accuracy and low ongoing cost of ownership, ensuring you can meet your immediate and future challenges.

Powerful and intuitive software

- Intuitive interface makes it ideal for university teaching and research laboratories.
- Flexibility to run simple, preconfigured methods for undergraduate students, through to advanced methods for academic research.
- Applications include scanning, concentration, kinetics, and RNA/DNA measurements.

Advanced kinetics analysis

- Data collection rates can be varied to collect more data when you need it. The Kinetics software also accommodates long, slow reactions and can collect data for up to 5 days without limiting the number of data points collected.

Flexible data collection

- Wide range of accessories to cater for a diversity of uses.
- Fiber-optic probes eliminate the need to transfer liquid samples to cuvettes, reducing sample loss and user error.

Eliminate cuvette and sipper hassles
By using fiber optics probes, you'll never have to buy or clean a cuvette again.

Self-paced learning
The Agilent Cary 60 WinUV software includes step-by-step wizards and video clips to help bring users up to speed quickly.

Solid sample measurements
The solid sample holders are compatible with a range of sample types.

Biotech and Pharma Applications

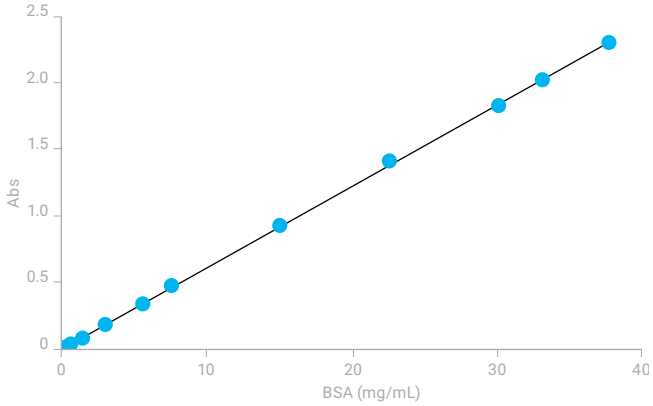
In a field that demands accuracy, productivity and regulatory compliance, your challenges have never been greater. The Agilent Cary 60 provides protection for precious samples, and ensures that you can measure your samples with the highest accuracy.

Protect precious samples

- The fiber optic microprobe and microvolume sampling cell enable measurements of < 4 µL for precious biological and chemical samples.
- Photosensitive samples are not exposed to continuous light as the lamp flashes only to acquire a data point, preventing photodegradation.
- Sample compartment temperature is stable, as the lamp does not produce heat, ensuring accurate and reproducible data.

Compliance and validation

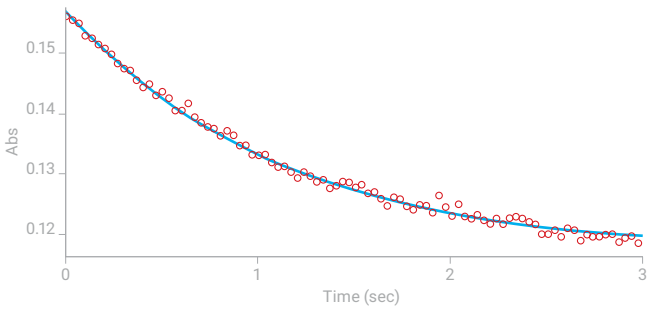
- Optional 21 CFR Part 11 control for all software applications.
- USP, EP, and BP instrument performance tests provided as standard.
- Instrument test automation using the multicell holder accessory—just press start and walk away.
- Qualification services (IQ/OQ) for the Agilent Cary 60 hardware, software, and accessories is available.



Measure microvolume samples
Determine the amount of BSA protein over a wide range of concentrations using <4 µL of sample in a microvolume sampling cell. The exceptional photometric linearity of the Cary 60 ensures that data is accurate and reproducible, and eliminates sample dilution before measurement.

Rapid and precise kinetics measurements

- Collect data at 80 points per second, and pause data collection at any time to add reagents without affecting performance.
- Extend collection times during a run.
- Collect your kinetics data and perform enzyme kinetics calculations all in the same application. Lineweaver-Burk, Eadie-Hofstee, Hanes-Woolf, Eadie-Scatchard, V0 vs [S], and Dixon 1/V0 vs [I] plots are available.



Measure short-lived reactions
The rapid mix accessory enables you to automatically start an analysis in less than 1/10th of a second after the two components are mixed.

Measure cold samples straight from the refrigerator!
Use the fiber optics probe to measure cold samples. As the microprobe is completely submerged in the sample there are no condensation problems, which are difficult to eliminate when using cuvettes.

Stopped flow kinetics
The rapid mix accessory is ideal for stopped flow kinetics measurements.

Monitor temperature
The temperature probe enables the temperature inside the cuvette to be measured, providing the most accurate data for temperature-dependent experiments. The WinUV software monitors the temperature directly from probe, ensuring data is collected at the correct temperature.

Agilent CrossLab: Real insight, real outcomes

CrossLab goes beyond instrumentation to bring you services, consumables, and lab-wide resource management. So your lab can improve efficiency, optimize operations, increase instrument uptime, develop user skill, and more.

Agilent CrossLab
From Insight to Outcome

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